Non-target effects of the nitrification inhibitors nitrapyrin and DMPP on soil microbial communities: perspectives utilizing total RNA sequencing.

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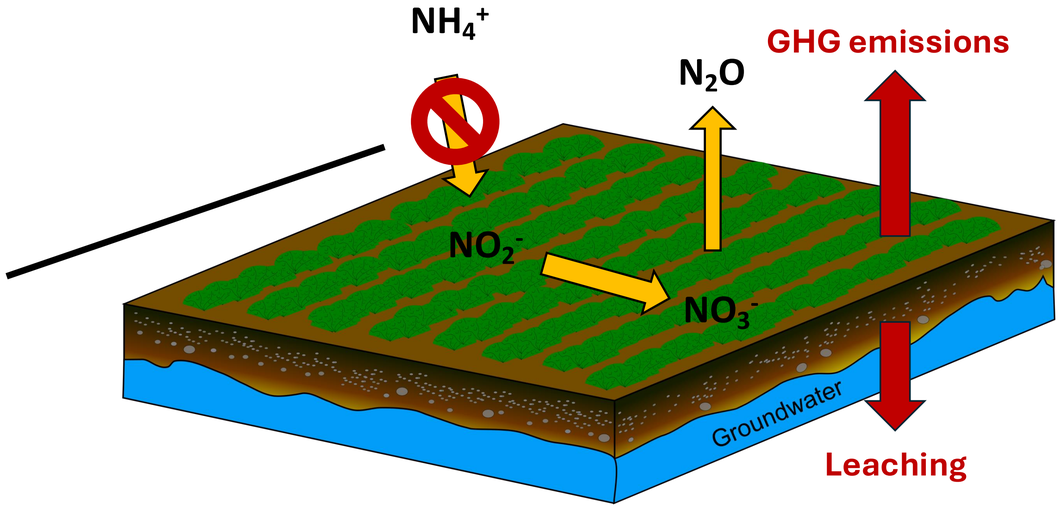
Nitrification of excess NH_4^+ from fertilizer applications cause:

- NO_3^- leaching into groundwater
- N_2O emissions into the atmosphere

Nitrification inhibitors such as nitrapyrin and DMPP block the initial step of nitrification ($NH_4^+ \rightarrow NO_2^-$)

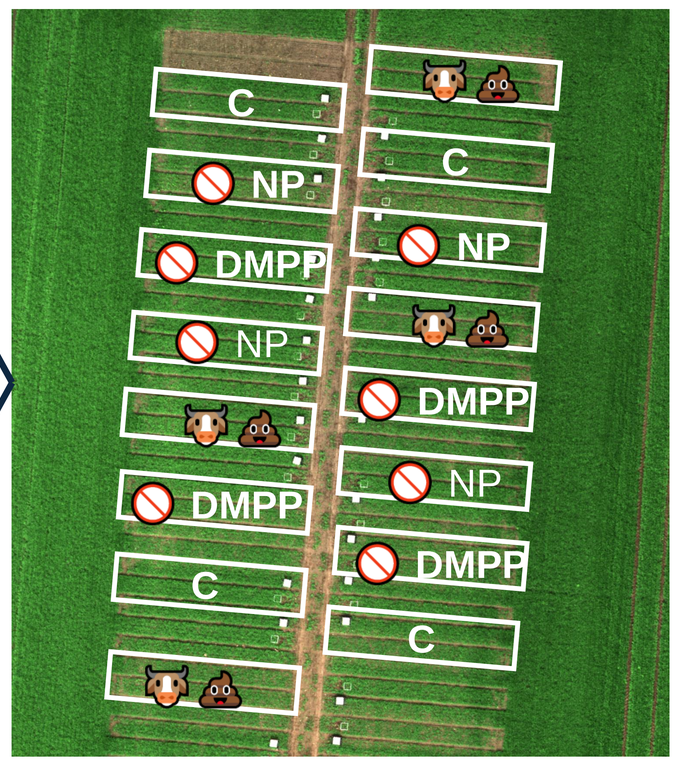
➡ potential to reduce environmental impact of fertilizer applications



What is the environmental risk of nitrification inhibitors for soil microbial ecosystems? - amoA project

2 field trials with spring barley:

4 treatments:



control
C

manure

manure + nitrapyrin
NP

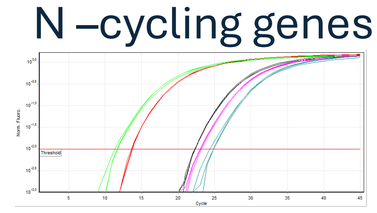
manure + DMPP
DMPP

8 time points:

- Before
- 48h
- 9 days
- 16 days
- 28 days
- 43 days
- Post-harvest
- Late autumn

Methods:

qPCR – effect on N –cycling genes



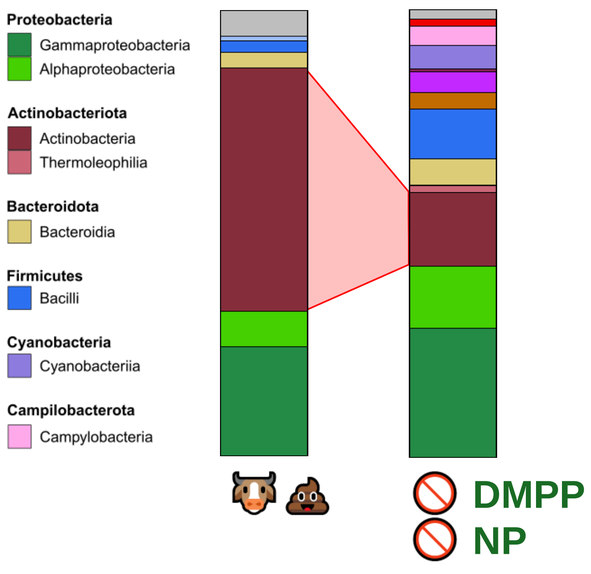
Quantification of *amoA*, *napA*, *narG*, *nirKS*, *nosZ*, *nifH* genes

RNA sequencing

Assessment of biodiversity and ecosystem functions

Monitoring non-target effects through the analysis of total RNA

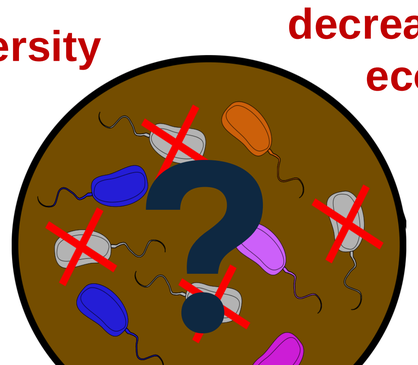
rRNA - taxonomic information about the **active** prokaryotic and eukaryotic microbial community



(exemplary data)

alpha diversity loss?

negative effect on known key taxa?

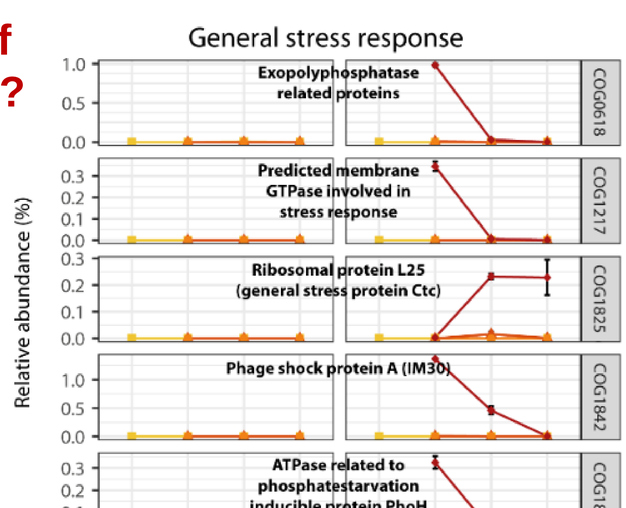


decreased expression of ecological functions?

Increased expression of known stress responses?

identification of previously unknown non-target effects!

mRNA - information about **actively transcribed** genes



(Bang-Andreasen et al., 2020)

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